USER'S MANUAL for TPAC1007 03 series Operator panel

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1. Introduction

To grant a fast setup of the device please follow carefully the information in this manual.

1.1. Staff skill

Products described in this manual are devoted to PLC programmers or automation experts only. MECT S.r.l. declines any responsibility about malfunctioning or damage caused by incorrect use of MECT devices, due to noncompliance to this manual information. MECT S.r.l has an help desk.

1.2. Symbols

Danger
Follow this advice to avoid people injury.

Warning
Follow this advice to protect the device.

Caution
Follow this advice to have a more effective performance.

ESD (Electrostatic discharge)
Danger: possibly damage due to Electrostatic discharge.

Note
Step to follow for a correct installation.

Additional information

1.3. Terms

PLC:	TPAC1007
Terminals:	TPLC005, MPNC010, MPNC020, MPNC030
System:	PLC (TPAC1007) with terminals

1.4. Security

Attention
Switch off devices before connecting them.

ESD (Electrostatic discharge)
Modules have electronic components that can be damaged by. electrostatic discharge. Be sure to be connected to ground when handle the devices.

The instrument has no power switch and no internal fuse, but it powers on immediately after connecting a correct power supply input (check the power supply value on the instrument label). Keep the power supply line as short as possible and keep it separate from other power lines.
For security reasons it is necessary to have a 2 section power switch with a fuse near the instrument and easily replaceable.
Avoid the presence of other power actuators in the same control panel, high humidity, excessive heat and corrosive gas.
Instruments must have a power supply from security transformers or SELV transformers.

1.5. REFERENCE MANUAL

ME7028 Mect configurator
ME7041 Quick Start

2. System description

TPAC1007 is a device composed by a PLC and a HMI with touch-screen monitor 4.3” width and 480 x 272 pixel resolution with 262.000 colors.
TPAC1007 allows the supervision of networked Modbus RTU and Modbus TCP devices. The networks are managed simultaneously by TPAC1007 and data from a network can be sent to another thus creating a bridge between the two networks.
On TPAC1007 a Micro-USB host port is present, that allows, with an adapter, the use of an USB-pen drive for software updates and data log.
On TPAC1007 are up to 1 Kbyte of retentive variables stored on flash.

The device is also able to manage an up to 8GB wide, micro SD card. The SD card is factory mounted on request.
A real-time clock maintains the date and time up to four months with the device turned off.
TPAC1007 is equipped with a micro PLC with several digital and analogue I/O to make a small automation of the process.

The device can be used in horizontal or in vertical orientation with the option "V" (see following pictures).

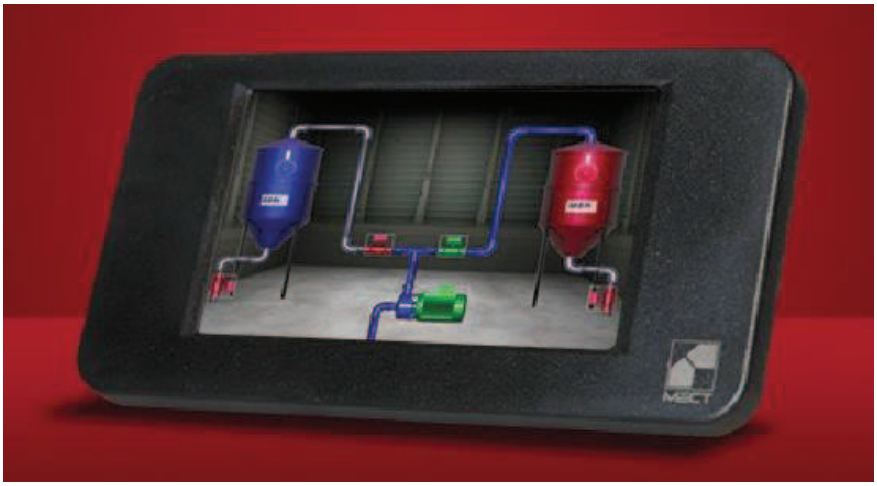


Figure 1: Front view TP1007 (horizontal version)

Figure 2: Front view TP1007 (vertical version)

2.1. Specification

TPAC1007 is based on a multiprocessor system. PLC and HMI are based on a 454MHz ARM9.

Table 1

PLC Hardware characteristics	
PLC Processor	ARM926JE 454MHz
RAM	128MB
FLASH	128MB
Non volatile variables	On FLASH memory
Real Time Clock	Yes with rechargeable battery
Screen	TFT 480 x 272 pixel 262k colors
Touch screen	Resistive 4 wires
Ethernet	10Mbit/s - 100Mbit/s self recognition
Micro-USB	Host 2.0
Micro SD	Max 8GB
PLC software characteristics	
OS	LINUX 2.35
PLC	IEC61131-3
Graphics	Based on QT library
ModBus	Modbus RTU master
Storage memory	Possibility of history storage
Field bus main features	
RTU Modbus	Master 2 wires
TCP Modbus	Client

Tensione di alimentazione	
24VDC	+20% - 10%
Power	3.5W digital output off

TPAC1007 03 Expansion features					
Analogue inputs	N° 2	**Input type**	**Resolution**	**Bit**	**Note**
		0÷20 mA	0.01mA	12	Input impedance 9Ω
		0÷10V	0.005V	12	Input impedance 1MΩ
		thermocouples J(0°C – 600°C), T(0°C – 400°C), K(0°C – 1200°C)	1°C	12	Cold junction compensation
		PT100 r -40.0°C – 200.0°C	0.1°C	12	
		PT100 E -40°C-800°C	1°C	12	
Analogue output	N° 1	**Output type**	**Resolution**	**Bit**	**Note**
		4÷20 mA	0.005mA	10	Max impedance: 400Ω
		0-10V	0.003V	10	Min impedance: 1KΩ
Digital inputs or encoder inputs	N°4 o 1	**Input type**	**Resolution**	**Bit**	**Note**
		PNP or Bidirectional Encoder	max frequency 500Hz	32	Inputs 2 e 3 can be used as incremental encoder max input frequency: 40kHz D2: input A D3: input B
Digital I/O	N°8	**I/O Type**	**Resolution**	**Bit**	**Note**
		PNP software configurable	Max Frequency 500Hz		200mA max for each output. 2 A max all outputs.
Power supply		24Vdc ±15% 400mA			
Serial output		Isolated half duplex RS485 Modbus			

Hardware installation

In the following figures see the TPAC1007 dimensions.

2.2. Mechanical dimensions

Side view

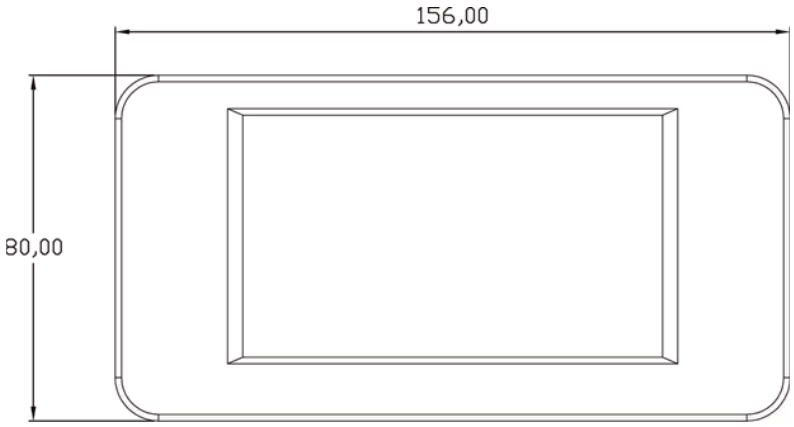


Figure 3

Rear view

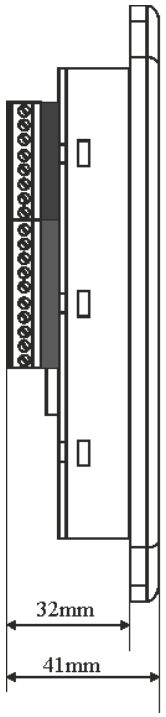


Figure 4

Side view

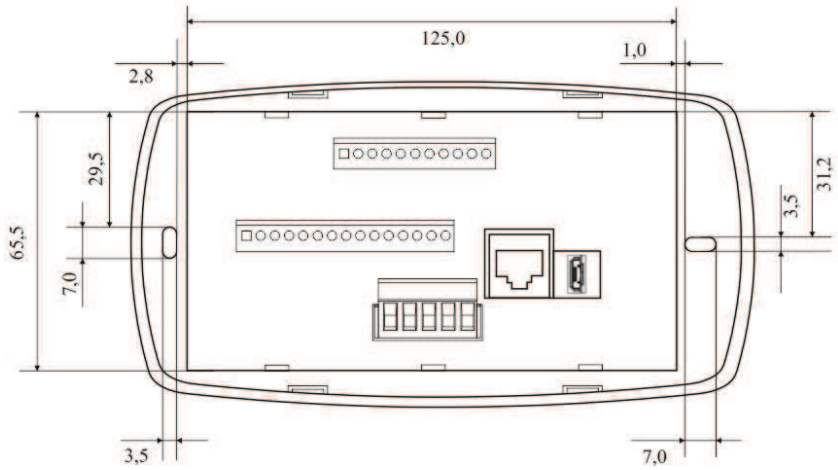


Figure 5

Technical specification

Table 2

Mechanical				
Material	ABS, Polycarbonate			
Dimensions W x L x H	41 mm x 159 mm x 83 mm			
Mounting plate	127mm x 68mm			
Installation	Panel installation			
Environmental conditions				
Operative temperature	0 °C ... 55 °C			
Storage Temperature	-20 °C ... +85 °C			
Relative Humidity	5 % a 95 % no condensation			
Electric isolation				
Air clearance	According to IEC 60664-1			
Pollution According to IEC 61131-2	2			
Protection				
Rear protection	IP 20			
Front protection	IP 65			
EMC				
EMC according to EN 61000-6-2 (2001)				
Test specification	**Values**		**Class**	**Criterion**
EN 61000-4-2 ESD	4 kV/8 kV (contact/air)		2/3	B
EN 61000-4-3 electromagnetic fields	10 V/m 80 MHz ... 1 GHz		3	A
EN 61000-4-4 burst	1 kV/2 kV (data/supply)		2/3	B
EN 61000-4-5 surge	Data:	-/- (line/line)		B
		1 kV (line/earth)	2	
	DC supply:	0.5 kV (line/line)	1	B
		0.5 kV (line/earth)	1	
	AC supply:	1 kV (line/line)	2	B
		2 kV (line/earth)	3	
EN 61000-4-6 RF disturbances	10 V/m 80 % AM (0.15 ... 80 MHz)		3	A
Emissions according to EN 61000-6-4 (2001)				
Test specification	**Limit values/IQPI**	**Frequency Range**	**Distance**	

EN 55011 (AC supply, conducted)	79 dB (µV)	150 kHz ... 500	
	73 dB (µV)	500 kHz ... 30	
EN 55011 (radiated)	40 dB (µV/m)	30 MHz ... 230	10 m
	47 dB (µV/m)	230 MHz ... 1	10 m
Emissions according to EN 61000-6-3 (2001)			
Test specification	**Limit values/IQPI**	**Frequency Range**	**Distance**
EN 55022 (AC supply, conducted)	66 ... 56 dB	150 kHz ... 500	
	56 dB (µV)	500 kHz ... 5	
	60 dB (µV)	5 MHz ... 30	
EN 55022 (DC supply/data, conducted)	40 ... 30 dB	150 kHz ... 500	
	30 dB (µA)	500 kHz ... 30	
EN 55022 (radiated)	30 dB (µV/m)	30 MHz ... 230	10 m
	37 dB (µV/m)	230 MHz ... 1	10 m

Attention
Install the device in a panel with no more than 55 °C.

2.3. Panel mount

2.3.1. Distance

System must be installed with a space for heat dissipation and cabling. Avoid superimposing cabling to avoid EMC problems.

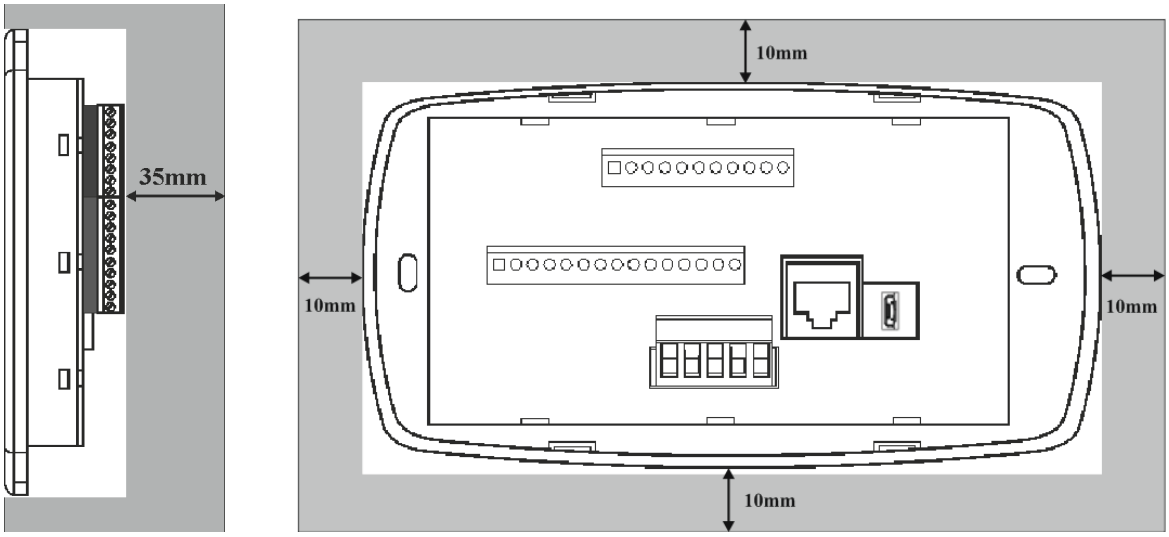


Figure 6A: Horizontal mounting

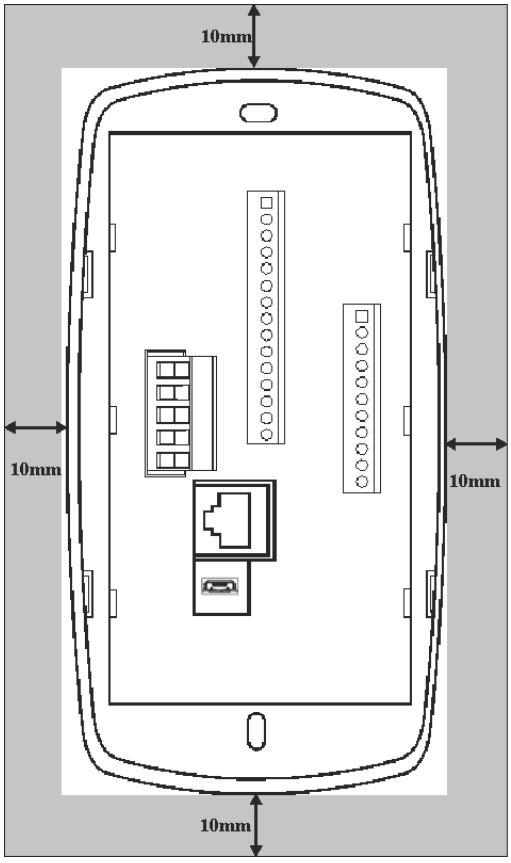


Figure 6B: Vertical mounting

3. Connections TPAC1007 03

Wiring description

In the following figure see the wiring diagram.

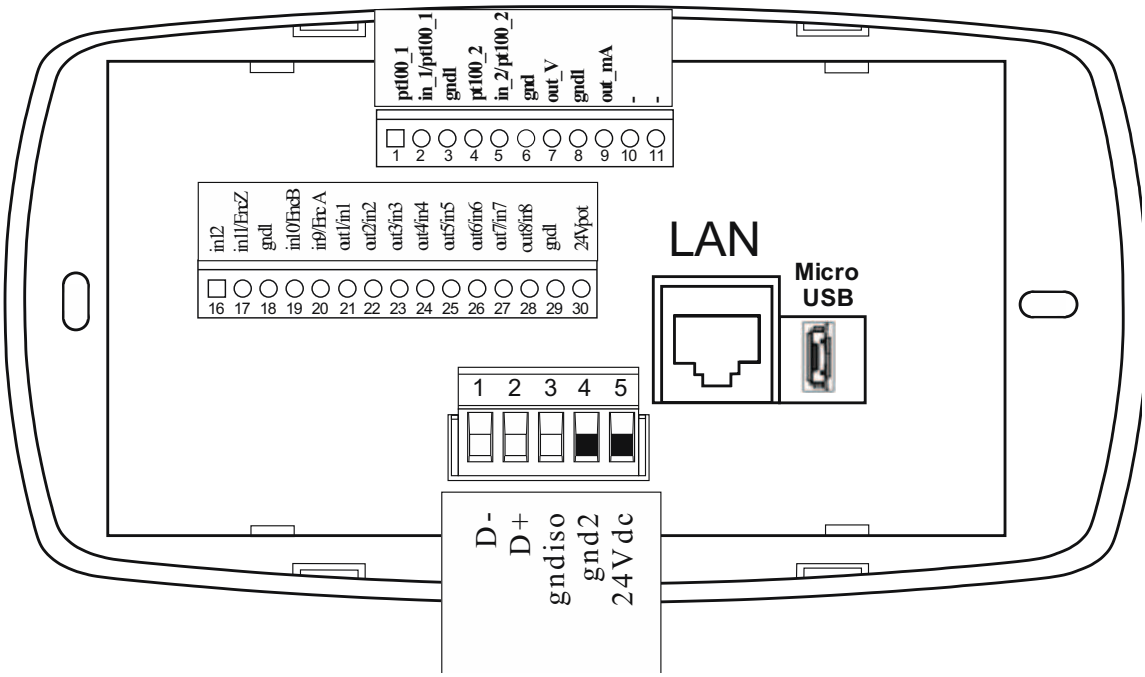


Figure 7

Legend :

- GND: ground reference for analog and digital I/O
- GND2: ground power separated by a diode respect to the GND ground
- GNDISO: Modbus optoisolated ground

Power supply

3.1 Isolation

Device has no galvanic isolation between input, output and power supply.

3.2 System power supply

TPAC1007 has a 24Vdc (-10 /+20%) , the main board and the expansion board as well, according to the scheme in the below figure. Both supply can be connected to the same power supply.
The circuit of the digital outputs is powered by the 29 (-) and the 30 (+) terminals. This circuit can be externally separated by a switch of power.
System is protected against reverse power supply.

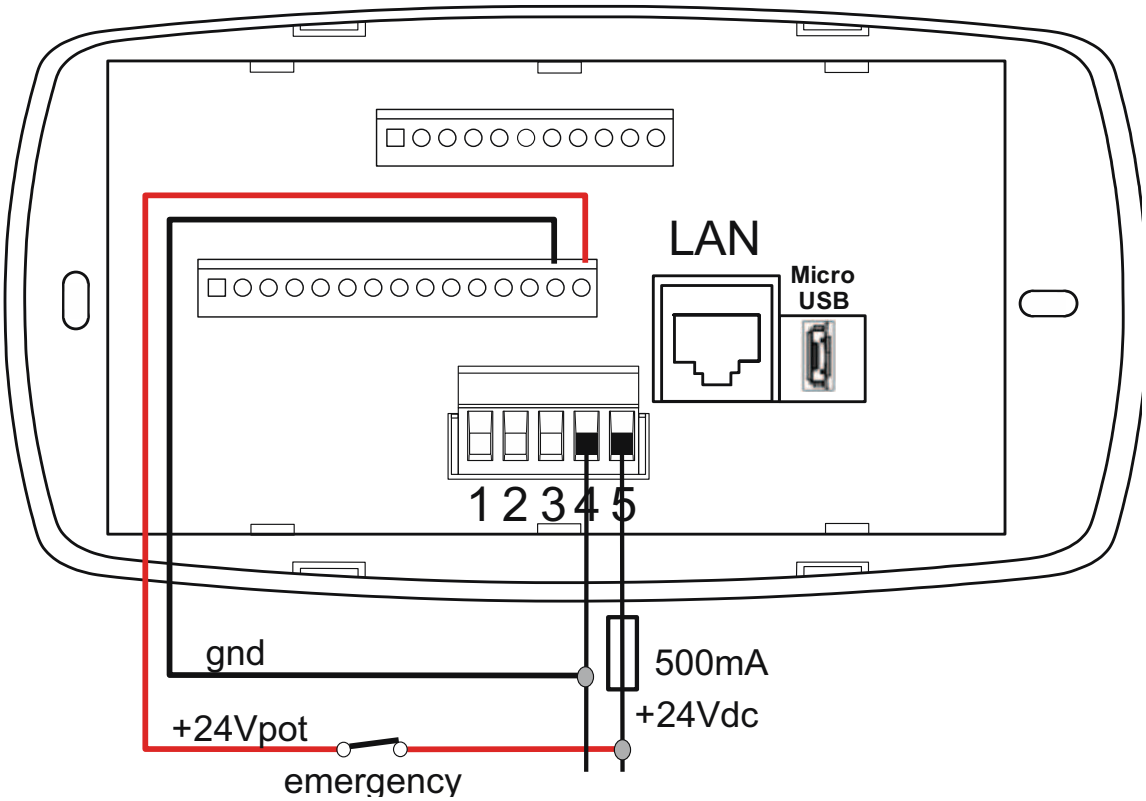


Figure 8

Attention
A wrong value for the power supply can cause a damage to the device

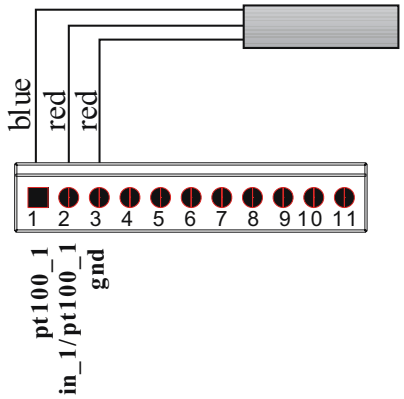
3.2.1 Fuse

System has no internal fuse , so it is suggested the use of an external 500mA fuse for the panel power supply.

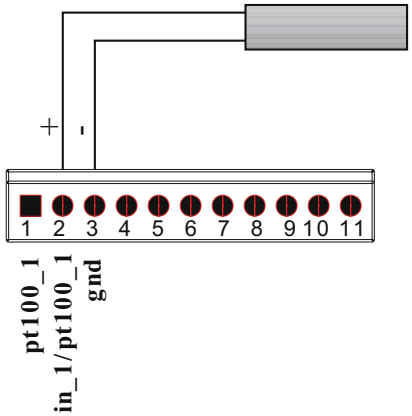
3.3IO wiring

Analogue and digital wiring

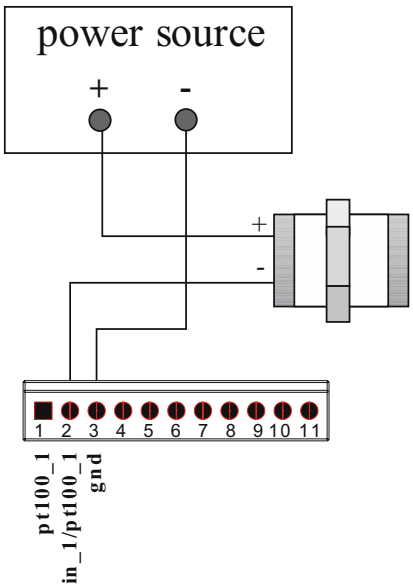
3 wire PT100 input. Wiring with too high resistance can cause measure errors. To use 2 wire PT100 short terminals 2 and 3.



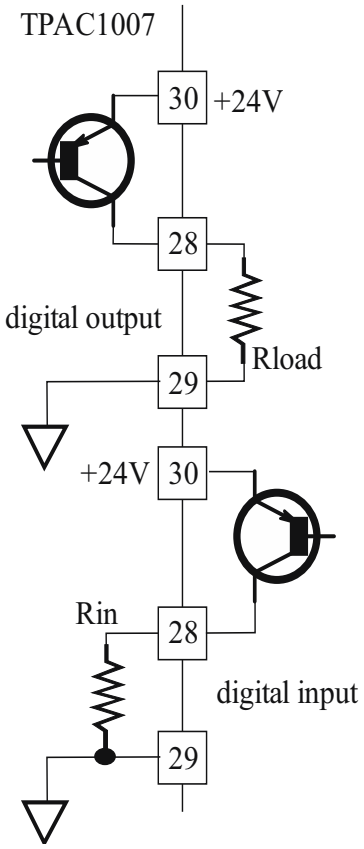
T/C input. Thermocouples must be isolated type. Use only proper thermocouples wire.



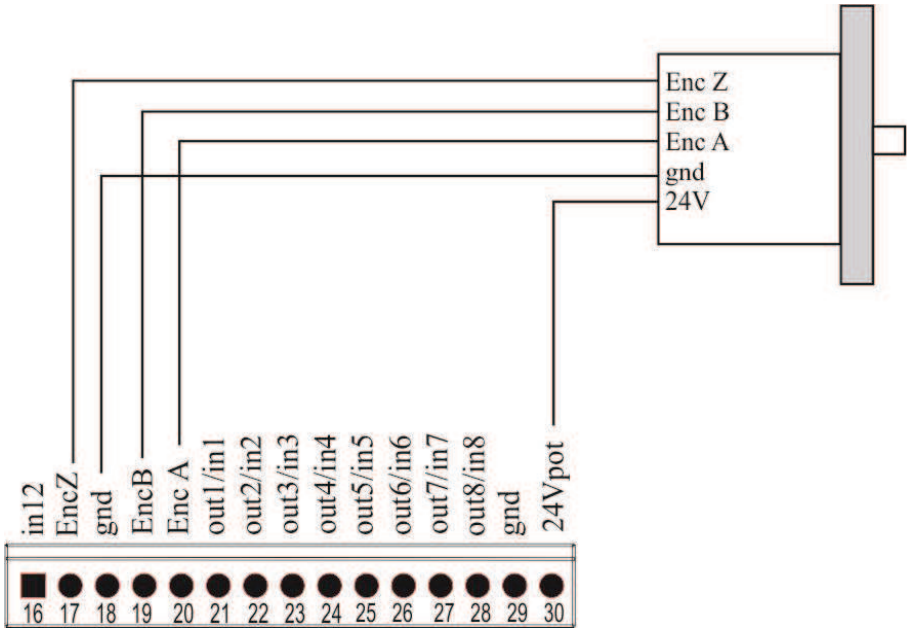
mA/V Input. Analogue inputs 4÷20mA and 0÷10V are connected to input and GND terminals. See figure to connect a 2 wire transducer with external power supply.



Digital I/O. Terminals 21 ÷ 28 can be configured as digital input or output . See in the figure the 28 terminal connection.
Terminals “17, 19 and 20” are high speed inputs (freq, ect)



Connecting to bidirectional encoder.



3.4 System variables

PLC variable	Type	Description
PLC_StatusReg	UINT	Expansion firmware revision
PLC_DigDir_1 **PLC_DigDir_2** **PLC_DigDir_3** **PLC_DigDir_4** **PLC_DigDir_5** **PLC_DigDir_6** **PLC_DigDir_7** **PLC_DigDir_8**	INT	8 Digital I/O configuration: • 0 input • 1 output Ex°: ch3 = output **PLC_DigDir_3 := 1;**
PLC_AnInConf_1	UINT	Analogue input configuration: • 0 not configured • 1 current • 2 voltage • 3 TCJ • 4 TCK • 5 TCT • 6 PT100E • 7 PT100R Ex°: ch1 = TCT **PLC_AnInConf_1 := 5;**
PLC_AnInConf_2	UINT	Analogue input configuration: • 0 not configured • 1 current • 2 voltage • 3 TCJ • 4 TCK • 5 TCT • 6 PT100E • 7 PT100R Ex°: ch1= not configured **PLC_AnOutConf_1 := 0;**
PLC_AnOutConf_1	UINT	Analogue output configuration: • 0 not configured • 1 current • 2 voltage Ex°: ch1= not configured **PLC_AnOutConf_1 := 0;**

PLC_DigIn_1 **PLC_DigIn_2** **PLC_DigIn_3** **PLC_DigIn_4**	INT	Digital inputs value (**Up to 12 digital** inputs depending of the number of digital outputs that need → 8 are configurable)
PLC_AnIn_1	INT	Analogue input value
PLC_AnIn_2	INT	Analogue input value
PLC_Tamb	INT	Temperature of cold junction
PLC_EncoderLo	UINT	Reading encoder (lower part)
PLC_EncoderHi	UINT	Reading encoder (upper part)
PLC_DigOut_1 **PLC_DigOut_2** **PLC_DigOut_3** **PLC_DigOut_4** **PLC_DigOut_5** **PLC_DigOut_6** **PLC_DigOut_7** **PLC_DigOut_8**	INT	Digital output value
PLC_AnOut_1	INT	Analogue output value
PLC_EncEnable	UINT	Enable encoder: • 0: disable encoder • 1: enable bidirectional encoder Ex°: Encoder = disable **PLC_EncEnable := 0;**
PLC_EncoderReset	UINT	Encoder reset

3.5 Variables use in a program

To use expansion board IO in a PLC insert statement **`#import`** **"LIO_TPAC1007.gvl"** in the program or function block where you need expansion variables.

After that the variables are available in read / write mode as described in the program tutorial.
The system can use 5472 interchange variables between HMI and automation (at maximum) which include:
internal variables, interchange variables on Modbus network, retentive variables.
The variables are defined by a software "Mect Suite" .

3.6 ModBus wiring

ModBus on TPAC1007 is a optoisolated 2 wire RS485 serial line, on the terminal board on pins:

Table 3

Pin	Signal	Description
3	GNDiso	
2	D +	Line +
1	D -	Line -

Example of a wiring of a system composed by:

- TPLC005
- MPNC020
- MPNC030
- TPAC1007

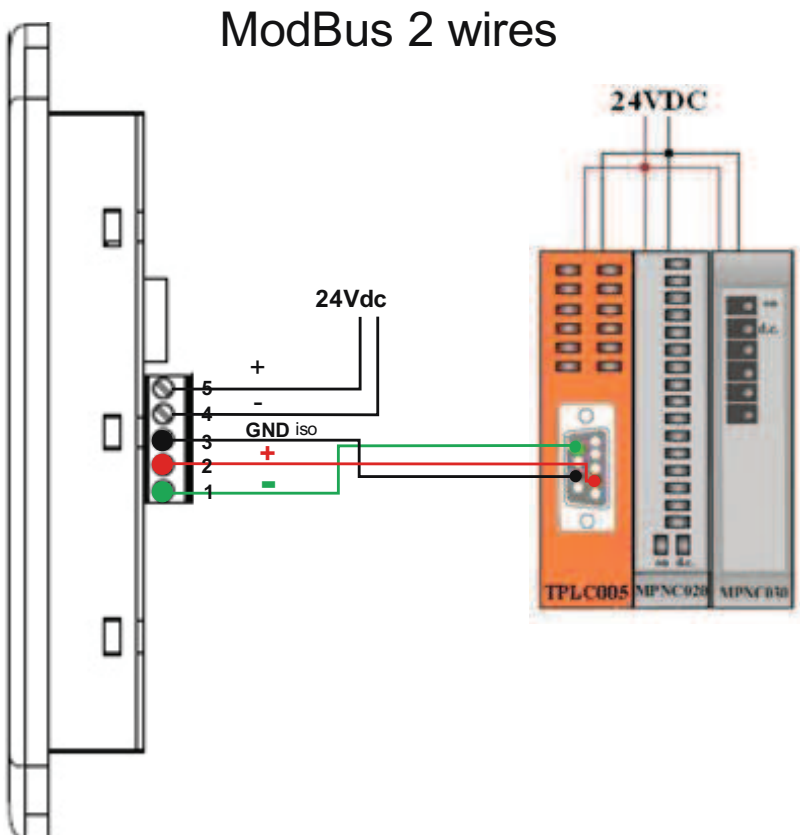


Figure 9

4 Peripherals

4.1 USB

TPAC1007 has a Micro-USB 2.0 host for:

- software update
- data storage: datalogger
- connect USB peripherals as printers, mouse, etc.

Specific connection of external peripherals are implemented on request.

4.2 Ethernet

TPAC1007 has a 10/100Mbit/s ethernet port with auto-configuration, the connection cable between TPAC1007 and a personal computer can be either straight or cross.

5 HMI

To set the TPAC1007 is necessary to develop a software in QT Creator based on QT libraries, custom-tailored on MECT operator panel.
A specific tutorial is furnished with the device.
The QT Creator software suite is available in Windows environment.

6 How to order

A *- Orientation*
Blank = Horizontal
V = Vertical

B *- Options*
Upon customer's request